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(54) Detergent composition.

(57) A fabric washing detergent composition includes a surfactant system which is a combination of (i) fatty acid ester sulphonate which is butyl or higher ester and (ii) nonionic surfactant with HLB less than 10.5.

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Description

DETERGENT COMPOSITION

This invention relates to a detergent composition, in particular to a detergent composition for washing fabrics.

Fabric washing compositions contain, as an essential ingredient, a surfactant system whose role is to assist in the removal of soil from the fabric and its suspension in the wash liquor. Suitable detergent active surfactant materials fall into a number of classes, including anionic, nonionic and cationic materials. Marketed products contain materials selected from one or more of these classes.

The most widely used anionic surfactant materials are the alkyl benzene sulphonates and these provide satisfactory results especially at high temperatures. There has been a desire to find alternative anionic surfactants for use in circumstances when alkyl benzene sulphonates are undesirable.

Among such alternative anionic surfactants are the fatty acid ester sulphonates (FAES) of the general formula

$$R^1 - CH(SO_3M) - COOR^2$$

where R^1 is an alkyl group derived from a fatty acid, usually from a natural source, R^2 is a short chain alkyl group, usually methyl and M is, for example, an alkali metal. Thus for example, United States patent 4416809 (Magari et al, assigned to Lion Corporation) discloses a composition containing FAES, soap and the salt of a polycarboxylic acid. Exemplified FAES materials are those in which R^1 is derived from tallow and R^2 is methyl. Ethyl or propyl are also mentioned as possibilities for R^2.

We have found, however, that the performance of such recommended FAES materials is unsatisfactory when the compositions also contain low HLB nonionic surfactants. Since the use of such nonionic surfactants has been shown to lead to a number of benefits, including an overall boosting in detergency (see GB 1241754 - Unilever), there is a desire to improve the performance of FAES materials in the presence of such nonionic materials.

We have now suprisingly discovered that this object can be achieved by the use of materials in which R^2 is butyl or higher alkyl.

Thus, according to the invention, there is provided a detergent composition including a surfactant system comprising:

i) a fatty acid ester sulphonate; and

ii) nonionic surfactant having an HLB of less than 10.5 preferably less than 9.5; wherein the fatty acid ester sulphonate has the general formula

$$R^1 - CH(SO_3M) - COOR^2$$

where R^1 and R^2 are independently hydrocarbon groups having at least 4 carbon atoms, the sum of the carbon atoms in groups R^1 and R^2 being from 8 to 30, and M is a monovalent cationic species.

The fatty acid ester sulphonate salts of the above general formula can be produced from fatty acids in conventional manner. Desirable starting fatty acids are, for example, those derived from tallow, palm oil or coconut oil. Thus, it is preferred that the group R^1 contains from 12 to 18 carbon atoms. It may be fully or substantially saturated. The group R^2 may have fewer carbon atoms than the group R^1. For instance the group R^2 may have from 4 to 8 carbon atoms. In particular it may be butyl.

The sum of the carbon atoms in groups R^1 and R^2 will preferably lie in the range 12 to 24. It is preferable also that R^1 and R^2 are different, especially when the sum of the carbon atoms in groups R^1 and R^2 is 14 or more. A preferred FAES material is that in which R^1 is coconut alkyl and R^2 is butyl.

Mixtures of FAES materials as defined above could be used. Other FAES materials, such as the tallow methyl material, may also be included in minor amounts, but there is no particular advantage in doing so.

It is preferred to use the water-soluble salts of these anionic surfactants, specifically the alkali metal (sodium or potassium) salts thereof.

Suitable nonionic surfactants which may be used are the reaction products of compounds having a hydrophobic group and a reactive hydrogen atom, for example aliphatic alcohols, acids, amides or alkyl phenols with alkylene oxides, especially ethylene oxide either alone or with propylene oxide. Specific nonionic detergent compounds are alkyl (C_6 - C_{22}) phenols-ethylene oxide condensates, the condensation products of aliphatic (C_8 - C_{18}) primary or secondary linear or branched alcohols with ethylene oxide, and products made by condensation of ethylene oxide with the reaction products of propylene oxide and ethylenediamine.

When alkylene oxide adducts of fatty materials are used as the nonionic surfactants, the number of alkylene oxide groups per molecule has a considerable effect upon the HLB of the nonionic surfactant. The chain length and nature of the fatty material is also influential, and thus the preferred number of alkylene oxide groups per molecule depends upon the nature and chain length of the fatty material.

We have found it of advantage that the weight ratio between the anionic surfactant and the alkoxylated nonionic surfactant lies between 4:1 and 1:4, most preferably between 3:1 and 1:2, otherwise the benefits of the invention may not be achieved.

Preferred compositions according to the invention include the surfactant system in an amount from 2% to 50%, such as from 4% to 30% by weight of the composition.

The surfactant system may include other surfactant materials in addition to the specified sulphonate

and nonionic materials. These other surfactant materials may be selected from other anionic detergent active materials, zwitterionic or amphoteric detergent active materials or mixtures thereof.

Any such further surfactant materials will generally be present at a level which is no more than 50% preferably no more than 40% of the total amount of surfactant in the composition, and might be not over 5% of the whole composition.

The other anionic detergent active materials may be the usual water-soluble alkali metal salts of organic sulphates and sulphonates having alkyl radicals containing from about 8 to about 22 carbon atoms, the term alkyl being used to include the alkyl portion of higher acyl radicals. Examples of suitable synthetic anionic detergent compounds are sodium and potassium alkyl sulphates, especially those obtained by sulphating higher (C_8 - C_{18}) alcohols produced for example from tallow or coconut oil, sodium and potassium alkyl (C_9 - C_{20}) benzene sulphonates, particularly sodium linear secondary alkyl (C_{10} - C_{15}) benzene sulphonates; sodium alkyl glyceryl ether sulphates, especially those ethers of the higher alcohols derived from tallow or coconut oil and synthetic alcohols derived from petroleum; sodium coconut oil fatty monoglyceride sulphates and sulphonates; sodium and potassium salts of sulphuric acid esters of higher (C_8 -C_{18}) fatty alcohol-alkylene oxide, particularly ethylene oxide, reaction products; the reaction products of fatty acids such as coconut fatty acids esterified with isethionic acid and neutralised with sodium hydroxide; sodium and potassium salts of fatty acid amides of methyl taurine; alkane monosulphonates such as those derived by reacting alpha-olefins (C_8 - C_{20}) with sodium bisulphite and those derived from reacting paraffins with SO_2 and Cl_2 and then hydrolysing with a base to product a random sulphate.

The compositions of the invention may contain a detergency builder material, this may be any material capable of reducing the level of free calcium ions in the wash liquor and will preferably provide the compositions with other beneficial properties such as the generation of an alkaline pH and the suspension of soil removed from the fabric.

Examples of phosphorus-containing inorganic detergency builders, when present, include the water-soluble salts, especially alkali metal pyrophosphates, orthophosphates, orthophosphates, polyphosphates and phosphonates. Specific examples of inorganic phosphate builders include sodium and potassium tripolyphosphates, ortho phosphates and hexametaphosphates.

Examples of non-phosphorus-containing inorganic detergency builders, when present, include water-soluble alkali metal carbonates, bicarbonates, silicates and crystalline and amorphous aluminosilicates. Specific examples include sodium carbonate (with or without calcite seeds), potassium carbonate (with or without calcite seeds), sodium and potassium bicarbonates and silicates.

Examples of organic detergency builders, when present, include the alkali metal, ammonium and substituted ammonium polyacetates, carboxylates, polycarboxylates, polyacetyl carboxylates and polyhydroxysulphonates. Specific examples include sodium, potassium, lithium, ammonium and substituted ammonium salts of ethylenediaminetetraacetic acid, nitrilotriacetic acid, oxydisuccinic acid, melitic acid, benzene polycarboxylic acids and citric acid.

It is preferred that the compositions according to the invention be alkaline, that is at the concentration of 1 g/l in distilled water at 25° C the pH should be at least 8, preferably at least 10. To this end the compositions may include a water-soluble alkaline salt. This salt may be a detergency builder or a non-building alkaline material.

Apart from the ingredients already mentioned, a number of optional ingredients may also be present.

Examples of other ingredients which may be present in the composition include fabric softening agents such as fatty amines, fabric softening clay materials, lather boosters such as alkanolamides, particularly the monoethanolamides derived from palm kernel fatty acids and coconut fatty acids, lather depressants, oxygen-releasing bleaching agents such as sodium perborate and sodium percarbonate, peracid bleach precursors, chlorine-releasing bleaching agents such as tricloroisocyanuric acid, inorganic salts such as sodium sulphate, and, usually present in very minor amounts, fluorescent agents, perfumes including deodorant perfumes, enzymes such as proteases, cellulases, amylases and lipase, germicides and colourants.

The detergent compositions according to the invention may be prepared by a number of different methods according to their physical form. In the case of granular products they may be prepared by dry-mixing or coagglomeration. A preferred physical form is a granule incorporating a detergency builder salt and this is most conveniently manufactured by spray-drying at least part of the composition. In this process a slurry is prepared containing the heat-insensitive components of the composition such as the surfactant system, builder material and filler salt. The slurry is spray-dried to form base powder granules with which any solid heat-sensitive ingredients may be mixed, such ingredients including bleaches and enzymes. The specified nonionic surfactants can be liquidified by melting or solvent dissolution and sprayed onto the base powder granules, rather than including them in the slurry for spray-drying. The invention will now be described in more detail in the following non-limiting examples.

EXAMPLES 1 TO 6

Wash liquors were prepared in water having a hardness of 25° FH (equivalent to a free calcium ion concentration of 2.5×10^{-3} molar). The wash liquor contained the equivalent of 6 g/l of a composition containing (by weight)

Specified anionic surfactant	9%
Specified nonionic surfactant	4%
Sodium tripolyphosphate	23%
Sodium carbonate	6%
Sodium alkaline silicate	5.5%
Sodium sulphate	30.8%
Sodium chloride	2.93%
Water	balance

The sodium chloride was included as being equivalent in ionic strength to 5% sodium perborate monohydrate which would be present in practice. The bleach is left out of these experiments in order to avoid confusion between detergency and bleaching effect in the interpretation of the results.

The wash liquors were used to wash a fabric load at a liquor to cloth ratio of 50:1. The load included a number of polyester monitors to which had previously been applied an amount of C^{14} tagged triolein. Measurement of the level of tagged triolein after washing, using standard radio-tracer techniques, gives an indication of the degree of detergency, ie. soil removal, obtained.

The wash time was 20 minutes with an agitation of 70 rpm. Washes were isothermal at 40 C.

In each case the nonionic surfactant was either SYNPERONIC A7 (Ex ICI) which is principally a C_{13}/C_{15} alcohol ethoxylated with an average of 7 moles ethylene oxide per molecule having an HLB of 11.7, or a 1:3 by weight mixture thereof with SYNPERONIC A3, which is a similar material containing an average of 3 moles of ethylene oxide per molecule, the mixture having an HLB of 9.0.

The anionic surfactants used were:

CM: Coconut methyl FAES

TEXIN ES 68: A tallow methyl FAES ex Henkel

LB: C_{12} alkyl butyl FAES

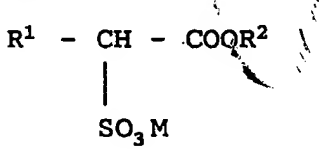
The results obtained were as follows:

Example No	Anionic	Nonionic	% soil removal
1	CM	A7	20.1
2	ES68	A7	20.6
3	LB	A7	19.8
4	CM	A7/A3	26.0
5	ES68	A7/A3	23.9
6	LB	A7/A3	36.2

These results show that in the presence of the higher HLB nonionic material (Examples 1 to 3) there is very little difference between the anionic surfactants tested. In the presence of the lower HLB nonionic mixture (A7/A3) however, significant preference for the C_{12} butyl FAES over the others tested is evident.

Claims

1. A detergent composition including a surfactant system comprising:i) a fatty acid ester sulphonate; and
ii) nonionic surfactant having an HLB of less than 10.5;
wherein the fatty acid ester sulphonate has the general formula



wherein R^1 and R^2 are independently hydrocarbon groups having at least 4 carbon atoms, the sum of the carbon atoms in groups R^1 and R^2 being from 8 to 30, and M is a monovalent cationic species.

2. A detergent composition according to claim 1 wherein the sum of the carbon atoms in groups R^1 and R^2 is from 12 to 24 carbon atoms.

3. A detergent composition according to claim 1 or claim 2 wherein the group R^1 is a hydrocarbon group containing from 12 to 18 carbon atoms.

4. A detergent composition according to claim 1, wherein the fatty acid ester sulphonate is an alkali metal salt of the sulphonate of the butyl ester of coconut fatty acid.

5. A detergent composition according to any one of the preceding claims wherein the nonionic surfactant has an HLB of 9.5 or less.

6. A detergent composition according to any one of the preceding claims wherein the surfactant system constitutes from 2 to 50% by weight of the whole composition, and the said fatty acid ester sulphonate and nonionic surfactant constitute 50 to 100% by weight of the surfactant system.